
EXECUTIVE SUMMARY

Project Description

The West Valley Demonstration Project (WVDP), the site of a U.S. Department of Energy (DOE) environmental cleanup activity operated by West Valley Nuclear Services Co. (WVNS), is in the process of stabilizing liquid high-level radioactive waste that remained at the site after commercial nuclear fuel reprocessing had been discontinued. The Project is located in Western New York State, about 30 miles south of Buffalo, within the New York State-owned Western New York Nuclear Service Center (WNYNSC).

The WVDP is currently focusing on seven major projects that will lead to completion of the cleanup work:

- shipping spent nuclear fuel to Idaho
- shipping low-level waste off-site for disposal
- constructing a facility where large high-activity components can be safely packaged for disposal
- packaging and removing expended materials from the vitrification facility

- removing the remaining waste in the high-level waste tanks and closing the tanks
- monitoring the environment and managing contaminated areas within the Project facility premises
- cleaning up and closing high-level waste-solidification facilities no longer in use.

Compliance

Management at the WVDP continued to provide strong support for environmental compliance in 2000. DOE Orders and applicable state and federal statutes and regulations are integrated into the Project's compliance program. Highlights of the 2000 compliance program were as follows:

- All State Pollutant Discharge Elimination System (SPDES) permit limits were met in 2000.

A reader opinion survey has been inserted in this report. If it is missing, please contact the Communications Department at (716) 942-4555. Additional Project information is available on the internet at <http://www.wvnsco.com>

- No notices of violation or inspection findings from any environmental regulatory agencies were received by the WVDP in 2000.
- Inspections of hazardous waste activities by the New York State Department of Environmental Conservation (NYSDEC) verified Project compliance with the applicable regulations.
- The Project continued to monitor specific waste management areas at the site in order to comply with the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent.
- The Project also met the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA) by collecting information about hazardous materials used at the Project and making this information available to the local community.
- The SPDES permit currently identifies four permitted liquid outfalls at the Project. A SPDES permit application was submitted to NYSDEC in 2000 to cover process changes and storm water runoff. A permit modification is not expected until 2002.
- In June 2000 the WVDP received final approval of a State Facility Air Permit from NYSDEC, one of the first such permits in this region.
- In accordance with the Site Treatment Plan developed under the Federal Facility Compliance Act, all calendar year 2000 milestones for the characterization, treatment, and disposition of mixed waste at the WVDP were completed.
- Among other pollution-prevention accomplishments, waste minimization goals for 2000 were met or exceeded in all but one of the waste

categories set in the one-year goals statement. Although low-level radioactive waste generation missed the established goal of 85%, it still was reduced by 73%.

- There were no unplanned off-site releases of radiological material in 2000.

Environmental Monitoring Program

Throughout the first three years of vitrification, specific and sustained attention was given to environmental monitoring and assessment of effluents from changing site operations. Project environmental scientists continued in 2000 to sample and measure effluent air and water, groundwater, surface streams, soil, sediment, vegetation, meat, milk, and game animals, and to record environmental radiation measurements. More than 10,000 samples were collected in order to assess the effect of site activities on public health, safety, and the environment.

The Project's environmental monitoring network is evaluated and updated to ensure that all the locations and sample types that would be sensitive to process-related changes are monitored. Samples are tested for radioactivity and/or non-radioactive substances using approved laboratory procedures. Both the laboratory test results and direct measurement data are reviewed at several stages for quality and for comparison with similar data.

The environmental data are entered in a controlled database and are automatically compared with upper and lower acceptance values. Data points falling outside these values are brought to the attention of WVDP scientists for further investigation. WVDP scientists assess all data points and evaluate trends at each location.

Surface Water Monitoring. The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment facility through the lagoon 3 release outfall. The treated effluent water flows into Erdman Brook, which joins Frank's Creek just before exiting the Project's fenced area. Six treated batches totaling approximately 11.5 million gallons were released periodically over the course of thirty-seven days in 2000. In 1999, 7.7 million gallons were released. The difference can be attributed to a lag in batch releases of water from facility cleanup processes along with more precipitation in 2000 than in 1999.

The combined average concentration of all radionuclides in liquid releases from lagoon 3 in 2000 was approximately 34% of the DOE derived concentration guide (DCG), which is used to evaluate liquid process discharges. (See Chapter 1, p.1-5, for an explanation of DCGs.) The average radioactivity concentrations from 1996 through 2000 were 35%, 22%, 23%, 32%, and 34% of the DCG, respectively. The major dose contributors to the total combined liquid effluent in 2000 were cesium-137, strontium-90, and uranium-232. Higher concentrations of uranium-232 and strontium-90 in facility effluents may be a factor contributing to the increase between 1999 and 2000.

Surface water is routinely sampled on the Project premises by four automatic samplers: Timed composite samples are collected at Frank's Creek where it exits the Project, at two other on-site points where water flows off-site, and at a surface drainage point near the former radioactive waste disposal areas. Samples also are collected periodically at nine other points of drainage from facility areas. The data from these samples are used to determine the type,

amount, and probable origin of both radiological and nonradiological contaminants.

As in 1999, the most notable source of gross beta and strontium-90 radioactivity in surface water in 2000 was from groundwater migrating through the subsurface of the north plateau and emerging as seepage to join the surface water drainage from the north plateau into Frank's Creek. (See location WNSWAMP on Fig.A-2 in Appendix A [p.A-4].) This drainage point has been carefully monitored since the contaminated seep was identified in 1993. A groundwater recovery and treatment system currently is being used to reduce the migration of strontium-90 to surface water on the north plateau. The strontium-90 concentration at WNSWAMP, which originates from pre-Project operations, dropped about 20% in 2000 from the concentration in 1999. The decrease in the strontium-90 concentrations in 2000 at this northeast swamp drainage is thought to be linked to a combination of groundwater dilution, dispersion, and more precipitation in 2000 than in 1999.

The WVDP is evaluating a pilot-scale permeable treatment wall installed in 1999 in order to treat contaminated groundwater on the north plateau. A subsurface trench filled with ion-exchange media, installed in the eastern lobe of the plume, removes contaminants from the groundwater as it flows through the trench. (See Chapter 3, p.3-16, for additional discussion of this technology.)

Nonradiological contaminants, measured at three outfalls and calculated at one monitoring point, were below the New York SPDES permit limits.

Soil and Stream Sediments. Surface soil is collected annually near the ten air sampler locations in order to track long-term deposition. Sediments from off-site creeks are collected annually from three downstream and two upstream locations. Soil from three on-site drainage areas is also sampled annually in order to track waterborne movement of contaminants.

Surface soil samples in 2000 showed little change from previous years. Except for one area that historically has shown average cesium-137 concentrations higher than background values, the concentrations of radionuclides normally present in soil from both worldwide fallout and from Project air emissions are no different at near-site locations than at background locations.

Because of pre-Project releases from nuclear fuel reprocessing activities, the concentrations of cesium-137 in downstream creek sediments have been historically higher than concentrations in the upstream sediments. However, in 1998 and 1999 sediment samples at one downstream location showed a marked decrease in cesium-137, compared with historical values, after an unusually high June 1998 flood. The calendar year 2000 samples rebounded to a level of cesium-137 that is consistent with historical values. The fifteen-year graph (Fig. 2-4 [p.2-13]) indicates no upward trends at either upstream or downstream points.

Groundwater Monitoring. Groundwater samples were collected as scheduled from sixty-five on-site locations in 2000. Computerized screening of calendar year 2000 data speeded identification and evaluation of changes. Monitoring activities in 2000 included gathering more detailed information about the north plateau strontium-90 contamination. The calendar year 2000 groundwater program confirmed that

strontium-90 is still the major contributor to elevated gross beta contamination in the plume on the north plateau. The concentrations of other isotopes were below the DCG levels usually applied to surface water.

In addition to collecting samples from wells, groundwater was routinely collected from seeps on the bank above Frank's Creek along the northeastern edge of the north plateau. Results of radiological analyses indicate that gross beta activity from the north plateau plume has not migrated to these seepage areas.

Site groundwater also is tested for a number of nonradiological contaminants: In 2000 there were no statistically remarkable changes in the levels measured.

As in previous years, calendar year 2000 sample results from near-site residential water-supply wells were within the historical range of values measured at the background well.

Air Monitoring. WVDP airborne radiological emissions in 2000 included emissions from six routinely operated permitted exhaust points and four exhausts excluded from permitting because of their low emission potential. As anticipated, radioactive releases from the Project in 2000 were far below the most restrictive limits that ensure public health and safety. Operating the vitrification process at a reduced capacity resulted in radiological air releases that were less than those noted in calendar year 1999.

The dose from air emissions in calendar year 2000 was about 0.08% of the EPA radionuclide emissions standard of 10 millirem (mrem) per year effective dose equivalent to the maximally exposed off-site individual. In 1999 the dose from these emissions was about 0.11%.

Although several fission products contribute to the radioactivity, the most significant continued to be airborne iodine-129, a long-lived radionuclide that exists in gaseous form at the high temperatures of the vitrification process and that is not fully removed during treatment of the air effluent. The calendar year 2000 levels of gaseous iodine-129 emissions were lower than 1999 levels. Approximately 99% of the 2000 calculated airborne dose to the public is attributable to iodine-129 emissions from vitrification-related processes.

Six air samplers on the perimeter of the WNYNSC and four in more distant locations continuously collect samples of air at the average human breathing height. The samples are tested for radioactivity carried by airborne particles. Samples also are collected for analysis for tritium and iodine-129 at two of the ten locations, the Rock Springs Road sampler near the site and the Great Valley background sampler.

Gross radioactivity (airborne particulate) in air samples from around the perimeter was within the historical range of radioactivity measured at remote background locations or nearby communities. Gross radioactivity at the nearest perimeter sampler remained the same in 2000 as in 1999. Concentrations in samples from three on-site ambient air samplers located near waste storage facilities operated during 2000 also were far below any applicable limits.

Nitrogen oxides, nonradiological byproducts of the vitrification process, are monitored as part of the emission-control process. The WVDP continues to monitor nitrogen oxides and sulfur dioxide emissions as a condition of the New York State Facility Air permit. The monitoring demonstrates that emissions are well below the 99-ton cap for each. No opacity or permit limits were exceeded in 2000.

Vegetation, Meat, and Milk. Test results from near-site samples of beans, apples, corn, hay, beef, and milk were consistent with results noted in previous years. When near-site samples were compared with background samples, no site-related effects were noted.

Game Animals. Fifty fish specimens from Cattaraugus Creek were collected in 2000 for testing. Ten of these were from below the Springville dam, including species that migrate up from Lake Erie. Two semiannual sample sets of ten fish each were collected downstream of Buttermilk Creek, which receives Project liquid effluents, and two sets were collected upstream. These samples represent sportfishing species and bottom-feeding indicator species. Testing for gamma-emitting isotopes (see *gamma isotopic* in the Glossary) and strontium-90 showed a slight statistical difference in median concentrations of strontium-90 between upstream (background) fish and downstream fish collected above the dam. No statistical differences in other isotopes were noted in the fish samples.

Three samples of venison from near-site (WNYNSC) whitetail deer were tested for gamma-emitting isotopes and strontium-90. Control deer samples from locations more than thirty miles away from the site also were collected in 2000. Low levels of radioactivity from cesium-137, strontium-90, and naturally occurring potassium-40 were detectable in both control and near-site deer samples. Although results vary from year to year, data from the last ten years show no statistical differences between radionuclide concentrations in near-site and control venison samples.

In 2000, the seventh year of public access to portions of the WNYNSC for deer hunting, seventy-five deer were taken by hunters during

the hunting season. Although testing of the deer for radioactivity is made available by the WVDP, no hunters chose to have their venison tested.

Program Quality

The WVDP environmental monitoring program is designed to produce high-quality, reliable results. To maintain this standard, each scientist must give continuous attention to the details of sample handling, following approved collection and analysis procedures and data review. Formal self-assessments were performed, and the environmental laboratory also continued the practice of analyzing radiological crosscheck samples sent from a national laboratory. Of 120 radiological crosscheck analyses performed at both the on-site Project laboratory and off-site commercial service laboratories, 115 (96%) were within the control limits. The samples tested on-site at the Project environmental laboratory (twenty-five samples) were all within acceptable limits. Off-site laboratories address data deficiencies under approved quality assurance programs.

Test results from the crosscheck program, self-assessments, and comparisons of co-located sample measurements taken by independent agencies such as the New York State Department of Health (NYSDOH) and NYSDEC indicate that high quality standards are being met.

The WVNS Environmental Affairs and Quality Assurance departments also periodically conducted and documented reviews of program activities in 2000.

In addition, a November 2000 DOE Ohio Field Office surveillance of the WVDP environmental monitoring program showed that the WVDP was in compliance with applicable requirements.

Notable 2000 Events

In 1999 the WVDP was recommended for STAR status, the highest safety award given within the DOE. This award, received in early 2000, was granted in recognition of superior health and safety performance by contractor management and employees.

The WVDP also was recognized as a top environmental leader in 2000 and was accepted into the EPA's National Environmental Performance Track. The WVDP was awarded Charter Member status as one of the first facilities awarded membership. This award has been given to only four other DOE sites.

The WVDP is one of only two DOE sites to hold both the EPA's highest award for environmental sustainability and the DOE's STAR award.

Dose Assessment

There were no events affecting public health and safety or the environment associated with Project operations in 2000. The small amounts of radioactive materials that were released were assessed and doses were calculated using approved computer modeling codes. These evaluations also included calculations of doses received from the consumption of game animals and locally grown food. Airborne doses were calculated using CAP88-PC, an EPA-approved computer code. The result was a maximum dose to an off-site individual of 0.0081 millirem (mrem). The limit is 10 mrem. Doses from the liquid pathway to the maximally exposed person were estimated to be 0.030 mrem from Project effluents (excluding north plateau drainage). The north plateau drainage contribution to the total liquid dose was estimated to

be an additional 0.024 mrem. The predicted dose from all pathways was less than 0.07 mrem, or 0.07% of the 100-mrem DOE limit.

Conclusion

The West Valley Demonstration Project conducts extensive monitoring of on-site facilities and the surrounding environment. This program fulfills federal and state requirements to assess the effect of Project activities on public health and safety and the environment. In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 2000 continued to indicate that Project activities pose no threat to public health or safety or the environment.